UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

May 5, 2014

MEMORANDUM FOR: Joyce Ambrosius

CC: Rick Wantuck, Steve Thomas

FROM: David White

SUBJECT: Sleepy Hollow SRF Water Intake Recommendations

INTRODUCTION

This memo has been prepared to provide comments in response to the Sleepy Hollow Steelhead Rearing Facility Sediment Control and Intake Retrofit reports (List Engineering Company 2010, 2003) and observations made during a site visit on November 15, 2013. These comments are meant to supplement the discussion of facility improvements and possible upgrades.

SUMMARY

High priority needs at this facility include 1. Improved access to the pumps and controls during extreme high and low water events, 2. An improved fish screen that does not clog with leaves or go dry during low water conditions, and 3. Reduced sediment input and associated damage to pumps and other equipment. The List Engineering reports appropriately identify these priorities. Design suggestions are provided in the Existing Intake *Recommendations* section.

Another important priority, not highlighted in the reports, is improving the reliability of the water supply source. In some years (including this past year), river flows are less than the level needed to supply the facility, requiring the premature release of fish back to the river. In addition, future sediment levels may increase in response to the dam removal. Finally, facility capabilities may need to be changed or upgraded in response to the needs of the steelhead population. These factors call for an improved water source.

The water supply source could be improved by moving the intake to the deep pool near the facility outfall, or by adding a recirculating water system. A recirculating system is ultimately a more secure and predictable water source. If needed, a recirculating system can be isolated from the river entirely for extended periods. A recirculating system may allow the new intake and screen to be reduced in size.

Another priority is sufficient water storage and a system to deal with occasional disease treatments (either storage tanks or on-land dispersal) to deal with treated water when it is not appropriate to discharge treated water directly into the stream or back into a recirculating system.

Other benefits and drawbacks are provided in the Existing Water Supply *Recommendations* section. A recirculating system for this facility could likely be constructed for approximately $500,000.

DETAILED COMMENTS

EXISTING INTAKE

The existing intake is a cylindrical Tee screen on the river bottom supplying water to a pump housing on the river bank. The screen is vulnerable to clogging or damage from leafy debris and sediment moving downstream. The pump housing is a confined space containing pumps, motors, and electrical connections. This makes intake operation and maintenance difficult. At high river levels, the pump housing is underwater and operation and maintenance is not possible.

Recommendations

<u>Intake</u>
The intake should be moved out of the stream channel to a location where it is deeper and better protected from debris and sediment moving downstream. One way to do this is to build a concrete alcove into the stream bank that houses the fish screen (Image 1 below). This would require bank excavation for the alcove, as well as digging a trench for the supply pipe to the pumps. This would likely require additional environmental permitting.


Image 1- Example of alcove built into stream bank to house a cone-shaped fish screen.

Another possibility is relocating the intake from the current location to the 12 foot deep pool at the facility outfall. Water supply may be somewhat colder at this location, and water level would be more secure during drought periods. An intake at this location would also be more protected from leaves and other debris, reducing maintenance. However, pumping costs at this location would be significantly higher.

Fish Screen

Various types of fish screens are possible at this location. A cone screen (Image 2 below) is able to operate in as little as a foot of water depth. A cone screen also performs well under high debris and sediment loads. Given the shallow depth of this stream in summer, as well as past trouble here with heavy leafy debris and an expected increase in sediment supply, a cone screen would be a good choice for this project. A 3 cfs flow to the facility can easily be supplied by a relatively small (5 and 1/2 foot diameter) cone screen.


Image 2- Example of cone screen underwater in an alcove with external cleaning brushes in operation.

Pump Housing

The existing pump housing (wet well) should be improved. Maintenance, repair, and switching from one pump to another is difficult because the pump housing is in a cramped and partially submerged space. At higher flows, the entire pump housing is submerged and is therefore inaccessible. There are several ways to improve the safety and functionality of the pump housing, including:

1. Enlarge the housing.
2. Replace existing pumps with retractable pumps that are raised from above on rails.
3. Raise the motors and/or valve controls above the high water mark (Image 3 below). This would likely require installing a raised platform, and access during high water events would likely require a significant catwalk or a boat.

Image 3- Example of pump motor and electrical supply raised out of wet well to improve access.

EXISTING WATER SUPPLY

The facility currently operates between May and December in order to rear steelhead when river conditions are unfavorable. Approximately 900 gpm (2 cfs) of river water is pumped to the cooling tower, and from there flows into a cold well. From the cold well, water is pumped into the raceways, where it supports from 16,000 to 48,000 juveniles. After the last rearing pond, the water flows through a lava rock filter and back to the river. This is a single-pass system, meaning there is no water recirculation.

There are several water supply issues with the existing single-pass system. In some drought years, water depth at the existing intake is too low to operate. As a result (last year included), fish have had to be released from the facility prematurely, before river conditions were optimal. Also, the existing cooling tower is not cooling water to optimal levels (<60F) during periods of hot, humid weather and warm river temperatures.

As described previously, facility operations are limited to the periods when the river levels are below the level of the pump motors, which are submerged at high flows and cannot be accessed. Access in the pump housing is difficult even when water levels are below the pump motors. Additionally, at low water conditions in the fall, the screen becomes clogged with leaves and requires frequent maintenance. Finally, there is no water disinfection system.

Recommendations

Water Recirculation

Installing a full or partial water recirculation system would improve the reliability of operations, improve fish health, and expand the capabilities of the facility to potentially include year-round operation. While at this time year-round operation is not required, it may make sense to plan for this potential need during facility improvements.

In such a system, water would be collected at the downstream end of the rearing facility and pumped back upstream to the beginning of the system (Diagram 1). There it would be chilled, filtered (solids filter, biofilter, and protein skimmer), disinfected, and passed back into the rearing ponds. A concept diagram is provided below. A small quantity of water would still need to be drawn from the river to make up for evaporative loss, water leakage in the rearing channels, and to dilute waste build-up in the recirculating system. Also, single pass operation may still be needed during periods of salt or chemical treatments in the rearing ponds.

Benefits of a recirculating system:

1. Sediment protection- Protect the intake pumps and recirculating pumps from damage from sediment, since intake water could be stopped when sediment levels in the river are high.
2. Reduced size of the fish screen and intake pumps, since less intake water would be needed.
3. Year round facility operation, if desired.
4. Improving control of temperature and water quality by selecting when water is drawn from the river.
5. Reduced energy cost to pump intake water. (This would be offset by increased energy costs to pump for recirculation).
6. Possibly increasing effectiveness of cooling tower- In hot and humid weather, water in the downstream rearing channels is cooler than river temperatures, and recirculating it will likely yield lower overall temperatures.

Drawbacks of a recirculating system:

1. Additional capital costs of pumps and piping to recirculate water.

2. Additional capital costs of filtration (solids filter, biofilter, and protein skimmer to remove fish waste).
3. Additional cost of water disinfection.
4. Additional energy cost to pump water from facility end to beginning. (This would be partially offset by reduced pumping costs of intake water).
5. Possible additional energy cost to chill water on an annual basis (see number 6 under "Benefits" above).
6. O&M costs of recirculation system components.

Potential Costs:

Adding recirculation to this facility would require a water collection tank below the last rearing pond, additional pumping, piping, filtration, protein skimmers, and disinfection. Based on the costs of two other recirculating facilities, a very rough estimate of the cost of additional equipment needed for recirculation at this facility is $500,000.

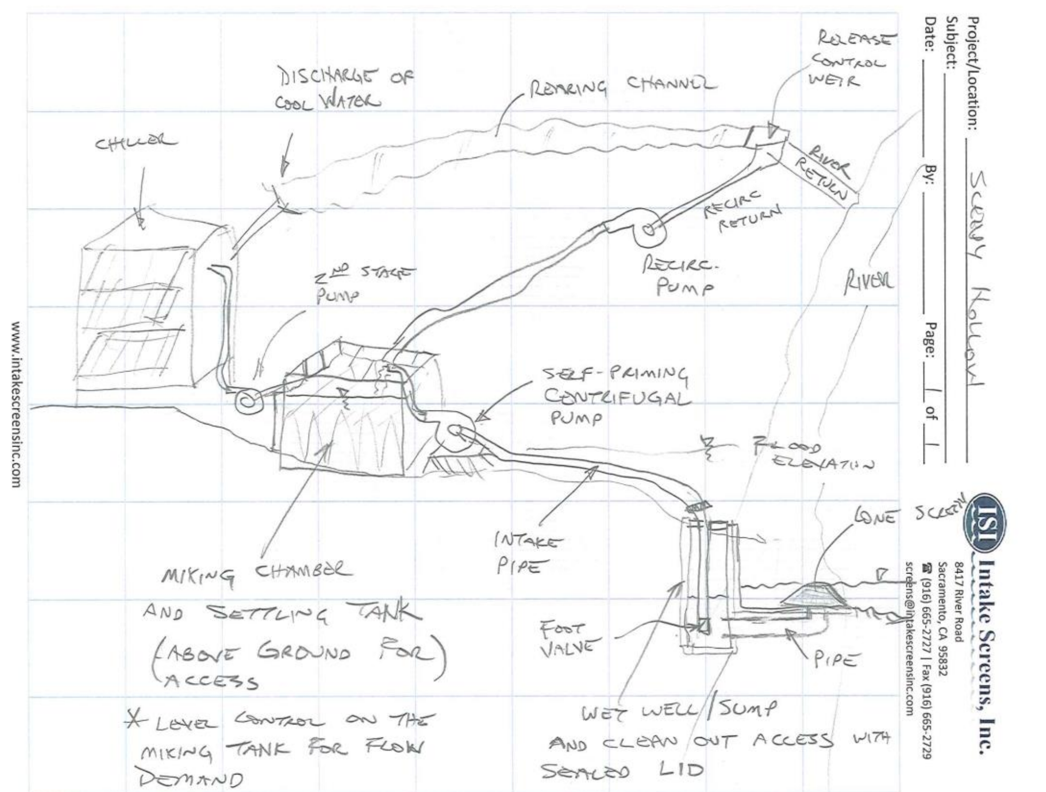

Diagram 1- Concept Drawing of Recirculating System (from Darryl Hayes, ISI)